USGS Research on Invasive Species and Climate Change in the Great Lakes

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USGS Research Focus

- Tools

  NAS database: Monitoring & mapping of
      newly invading species
    GODM: Predicting potential ranges with
      environmental stressors

- Research on one with implications for the other
    Lake level study
    Fish diseases
    Food web disruption

Monitoring and Mapping of Invasive Species

Invasive Species Forecasting and the Global Organism Detection and Monitoring system

Tom Stohlgren, Catherine Jarnevich, Tracy Davern (USGS),
Jim Graham, Greg Newman, Alycia Crall, Paul Evangelista and David Barnett (CSU), with help from . . .
Rick Shory, Mohammed Kalkhan, Hilary Drucker, Jon Freeman, Ginger Bradshaw,
Sara Simonson (NREL), John Kartesz (BONAP), Bruce Peterjohn,
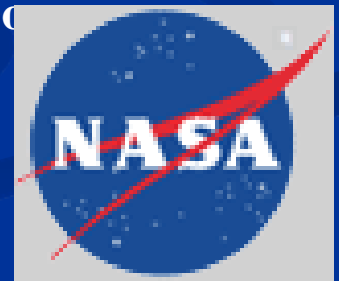Pam Fuller (USGS), Curt Flather (USFS),
John Schnase, Jeff Morisette, Ed Sheffner, Woody Turner (NASA) and many others!

USGS
science for a changing world

Tom_Stohlgren@usgs.gov   Web Page   http://www.NIISS.

USGS science for a changing world

Colorado State University® *Knowledge to Go Places*

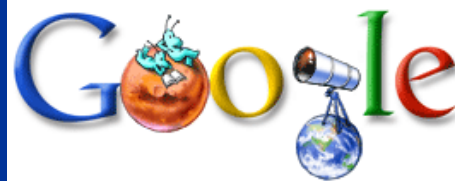Natural Resource Ecology Laboratory

nbii

NASA

Created February 2007

All Taxa – All Habitats
Terrestrial and aquatic!
Plants animals, and pathogens!
Remote Sensing and ancillary data
Many modeling approaches
The proper infrastructure
Critical mass of expertise.

What clients want:
• tools to collect/store field data
• data management help on the web
• simple GIS – see my points
• simple mapping tools
• some predictive modeling
• "watch lists"
• strategies: which species, which areas, and HOW
DO I KILL IT! And restore native species.
• all this help and information FREE, on the Web!

Online "Living Maps" of Species

Preliminary Model of Potential Spread in 10 Years

Control/
Restoration
Monitoring
Sites

Early Detection
Rapid Response Sites

Containment
Boundary

Priority
Survey Sites
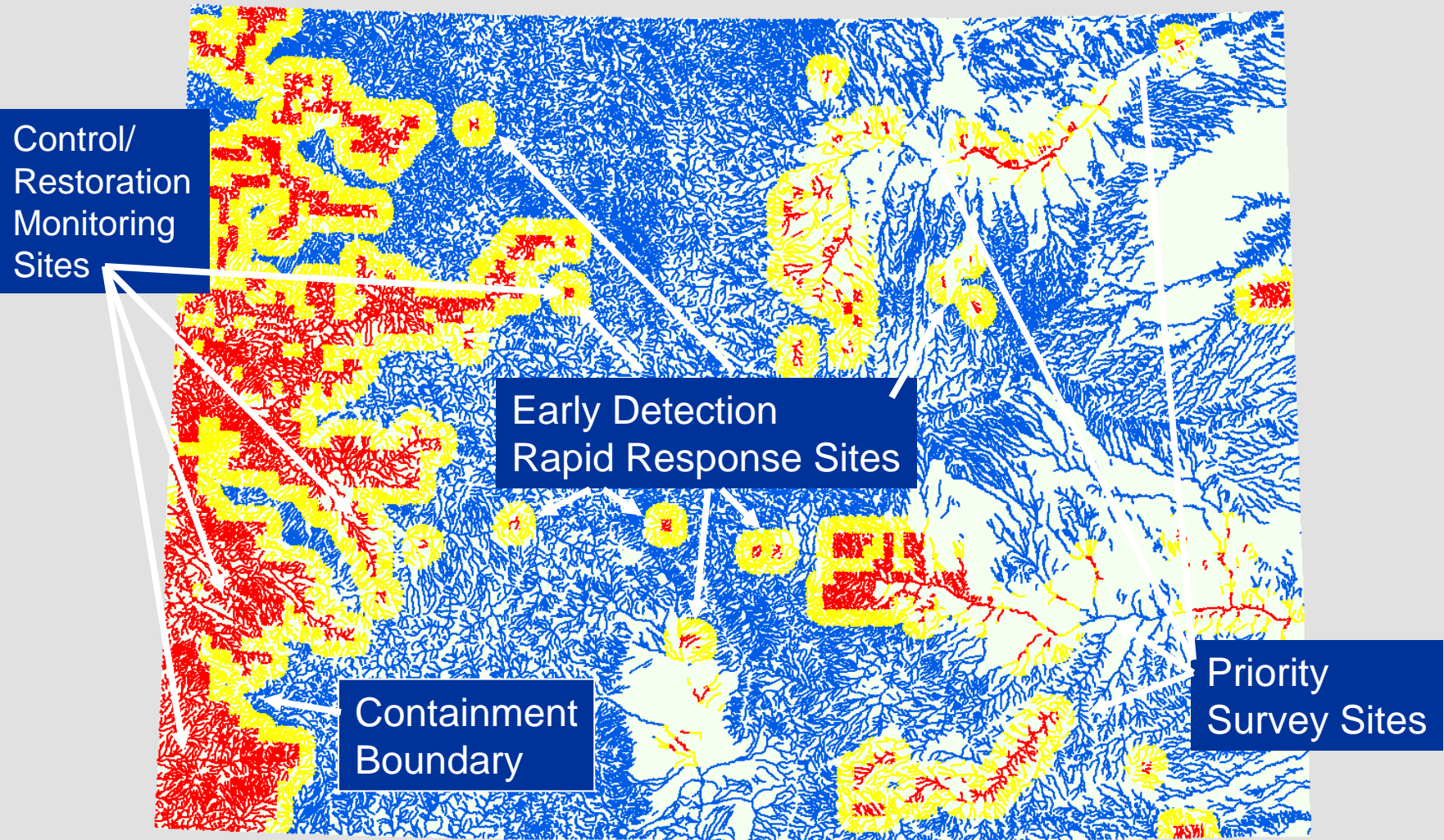
Legend

— Expected Spread Within Next 10 Years   — Absense Locations

— Present Distribution

Potential range of pythons in the US in the next 100 years with global climate change
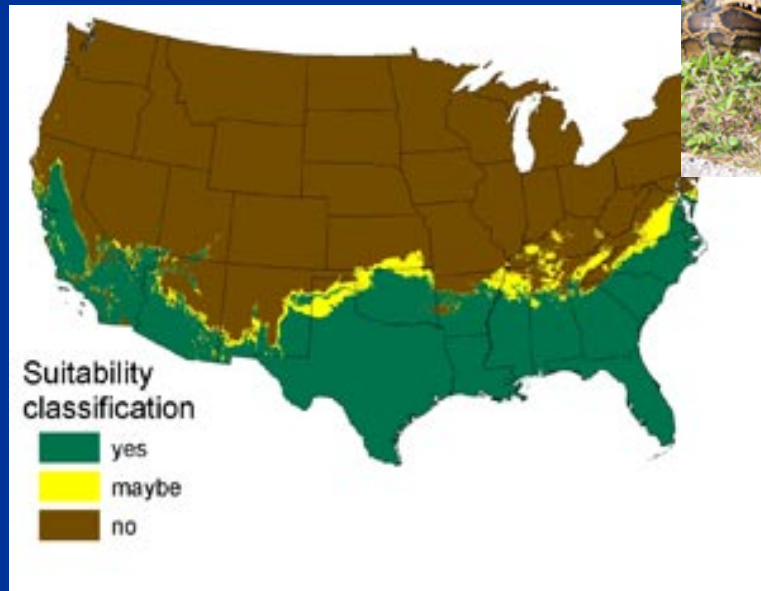
Areas in the US with climate matching that of the python in its native range
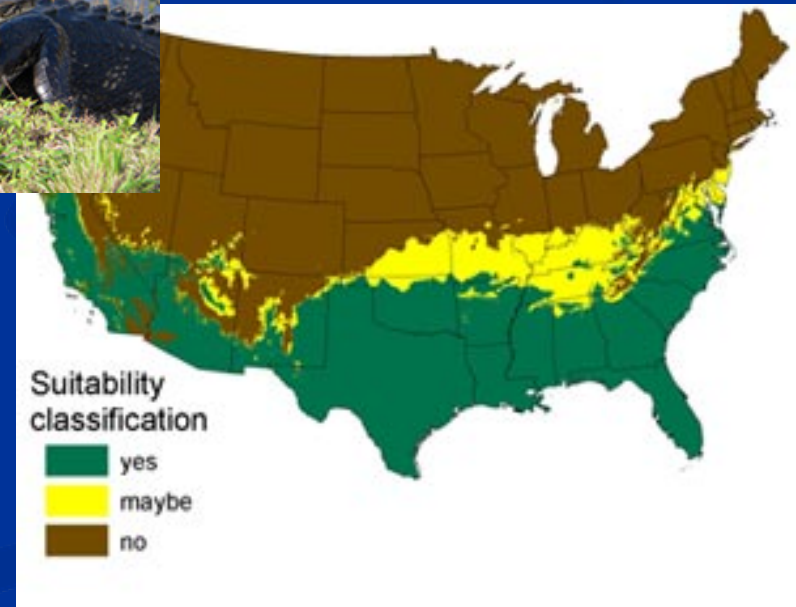
Projected climate in 2100 that matches habitat of python in its native range

Advanced Species Modeling Room

National Institute of Invasive Species Science
Fort Collins, CO

Great Lakes Lake-level Variability Study

Figure 8. Hydrograph of late Holocene lake level and historical lake level for Lake Michigan-Huron. The red line is interpreted from beach-ridge studies, whereas the lower black line is an inferred lower limit using the range of the historical record as a guide.
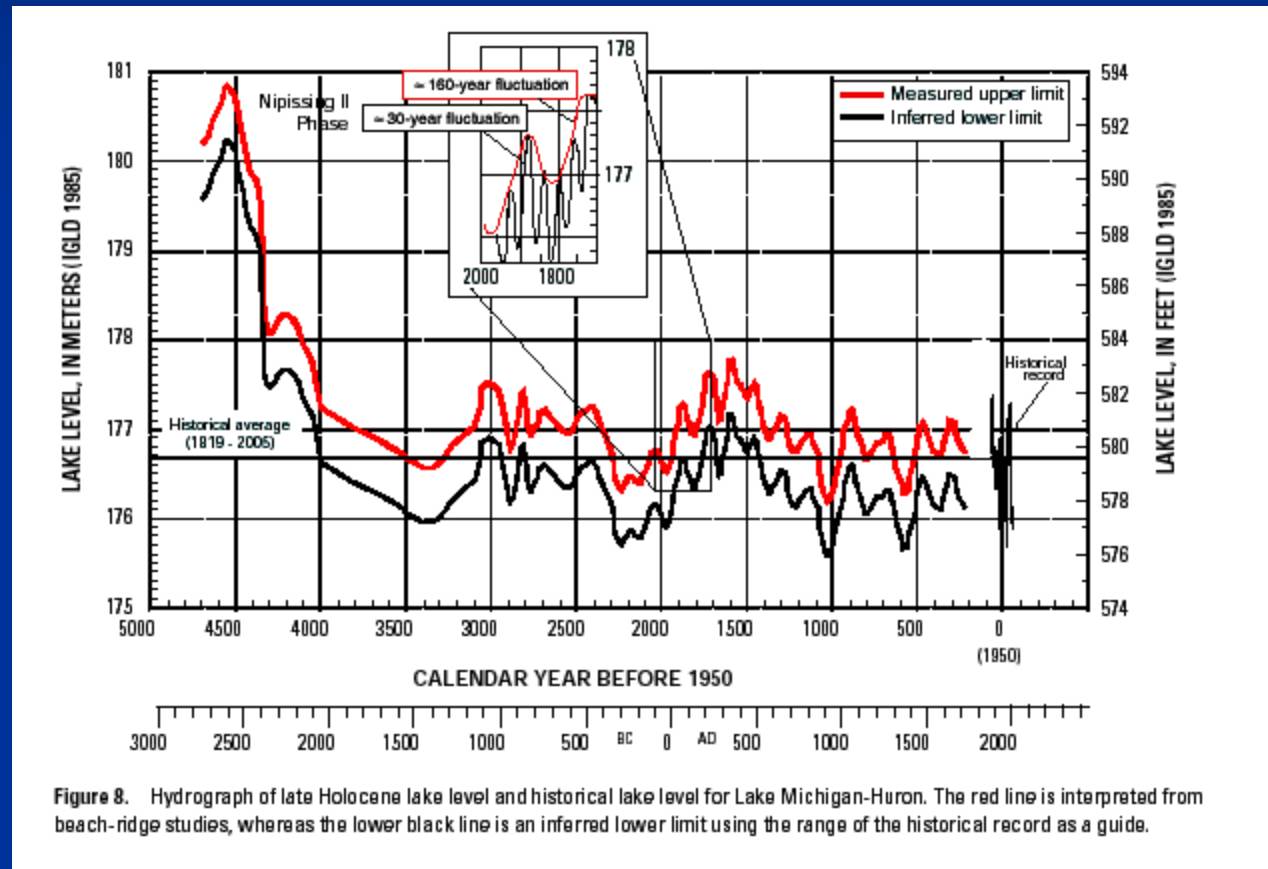
Wilcox et al. 2007 USGS Circular 1131

Fish Disease

Example: VHS

Jim Winton, USGS, WFRC, Seattle

Developed methods to detect viral hemorrhagic
   septicemia virus

Determined that VHS on the east coast was of different
   genetic background than those from the west coast

Food Web Disruption

Thiamine deficiency, related to the thiaminase content of planktivorous alewives, has been causally linked to early-life stage mortality (EMS).
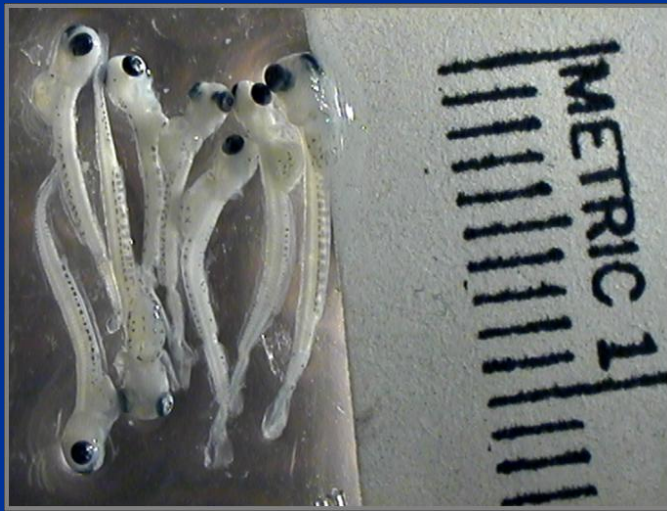
Don Tillitt, CERC, Columbia, MO
Developed suite of tools to detect thiaminase
Found high levels of thiaminase in zebra mussels
Looking for thiaminase in other parts of the food chain
Wondering about how nutrient cycling might enter into the picture

What's Missing?

- Studies designed to examine impacts of both global change and invasive species

- Effective management strategies so that resource managers can meet a variety of goals in the face of global change and invasive species

- Ability to accurately predict the impact of interaction between global change and invasive species